

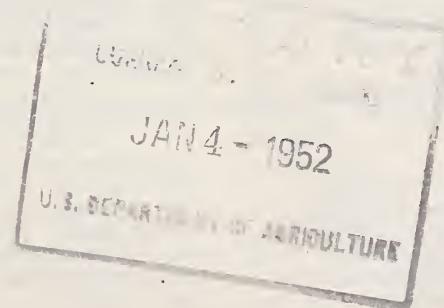
Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

5
2

REPORT OF THE CHIEF OF THE BUREAU OF HUMAN NUTRITION AND HOME ECONOMICS AGRICULTURAL RESEARCH ADMINISTRATION

1951



UNITED STATES DEPARTMENT OF AGRICULTURE

Report of the Chief of the Bureau of Human Nutrition and Home Economics, Agricultural Research Administration, 1951

UNITED STATES DEPARTMENT OF AGRICULTURE,
Washington, D. C., September 15, 1951.

DR. P. V. CARDON,
Agricultural Research Administrator.

DEAR DR. CARDON: I submit herewith the report of the Bureau of Human Nutrition and Home Economics for the fiscal year ended June 30, 1951.

Sincerely,

HAZEL K. STIEBELING,
Chief.

CONTENTS

Page		Page
Introduction-----	Farmhouse improvement-----	9
The nation's food and nutrition-----	Farmhouse plans for low-income families-----	9
Adequacy of the food supply-----	Kitchen plans-----	9
What families eat-----	Home lighting-----	10
Advances in nutrition knowledge-----	Home equipment-----	10
The body's response to diet-----	Farm refrigeration systems-----	10
Further knowledge of food values-----	Home freezers-----	11
Institutional uses of food-----	Performance of washing machines and water heaters-----	11
Good management — good school lunches-----	Research serving emergency needs-----	11
Effect of school lunch on nutrition-----	Food composition facts for the military services-----	12
Home freezing and canning of food-----	Handbook on group feeding-----	12
Advances in technology-----	Contract and cooperative research-----	12
Extent of home canning-----	Program planning and work management-----	13
Clothing and textile research-----	Summary of research publications-----	13
Clothes families wear-----		
House furnishings-----		
Fabric deterioration-----		
Disinfectants in household laundry-----		
9		

INTRODUCTION

The keystone in the structure of our Nation is the home. From it springs the physical and moral strength which enables the American people to meet capably the demands of peacetime living and wartime emergency. In normal times most of the production of agriculture and industry is geared to the demands of the home. But when the Nation's way of life is threatened, the home must share with the homeland and its allies those materials which are needed for the common defense. Yet the responsibility for keeping the home intact, the family well-nourished and adequately clothed never slackens. The Bureau of Human Nutrition and Home Economics exists to help the Nation's families make best use of the fruits of the field and the products of industry.

To fulfill this purpose, the Bureau carries on research to provide basic scientific information needed in solving problems that are met in everyday living. This work is supplemented by short-time studies to meet needs connected with a national emergency. The Bureau's research deals with human nutritional requirements; the composition and nutritive value of foods; improved methods of preparing and preserving foods; technical problems relating to quality and serviceability of clothing and household textile articles; ways of improving designs of farmhouses for comfort and efficiency; selection and management of household equipment; and economic studies to aid families in using time and money effectively.

Results of this research, prepared in semitechnical and technical form, are used by Extension workers, teachers, scientists, production and marketing specialists, writers, and other public leaders who work with, or on behalf of, the public. Their wide influence multiplies manyfold the application of findings from the research. The findings also are the basis for the Bureau's many bulletins for the homemaker, magazine articles, and radio and press stories that carry new information on how to buy, use, and care for food and fabric, and on improving the homes of the country.

THE NATION'S FOOD AND NUTRITION

Adequacy of the Food Supply

The Bureau is continuing its periodic appraisals of the nutritive value of the National food supply (based on consumption estimates provided by the Bureau of Agricultural Economics), making it possible to report on the per capita quantities of nutrients available from food, year by year since 1909.

The downward movement in the supply of major nutrients from the peak year 1946 through 1949 was reversed in 1950, and continues upward in 1951. Food supplies are abundant and varied enough in 1951 to provide for good nutrition of everyone in this country, if every person could get his needed share.

What Families Eat

Stemming from the Bureau's latest surveys of the food consumption of city and farm families are statistical reports showing how the Nation's food is distributed among groups of families within the population which stand most in need of better diets, and the use of specific food commodities by individual families. During the past year, four reports were issued, as additions to the 29 reports from these surveys previously published.

Nutritional improvement in city diets

One of this year's reports indicates that diets of city families averaged better in 1948 than in 1942, and better in 1942 than in 1936. Greatest progress has been made by low-income families, whose diets were most in need of improvement.

Among the underlying influences helping to improve the Nation's nutrition during recent years may be cited: Higher purchasing power of families, especially in the lower third of the income scale; the growing influence of nutrition education, both formal and informal; and programs affecting nutrition, such as the National school lunch program and enrichment of white flour, bread, and other grain products.

The practice of enriching cereal products with certain minerals and vitamins has now been in effect for 10 years, and figures based on Bureau diet surveys show that the nutritive content of diets of both rich and poor has been affected—the latter the more, because of the more important role grain products play in low-cost diets. In the spring of 1948, diets of city families with incomes of \$1,000 to \$2,000 were 14 percent higher in iron, 15 percent higher in niacin, and 5 percent higher in riboflavin than they would have been without enrichment of bread and flour. Corresponding figures for families with incomes of \$5,000 to \$7,500 were 10 percent in iron, 9 percent in niacin, and 2 percent in riboflavin. The greatest contribution was in thiamine, with increases of 20 percent in the lower and 13 percent in the higher income group.

Seasonal differences

Because of progress in food transportation, refrigeration, and packaging, city families can, if they so desire, eat fairly similar meals the year round. The extent of present-day seasonal differences in city families' use of food items in 1948 and the effect on nutritive value of diets are analyzed in a report issued this year.

The figures show that, while some foods—notably some fresh fruits and vegetables—vary widely in seasonal use, the same foods in other forms or similar foods keep the food pattern in balance, so that in general the total consumption of food in broad groupings differs little throughout the year.

Nutritive value of city diets, likewise, remains fairly constant from season to season, except in summer when it is slightly lower. The average number of calories in summer diets is about 5 percent lower than the year's average—probably reflecting not only a shift to foods typical of summer menus, but also an actual decrease in food-energy needs.

Meat in city diets

A series of commodity reports begun during the past year shows the variation among families in their use of an important food and the effect on purchases of other foods and on the nutritive value of diets when its consumption is relatively high or low. Data for meat were the first analyzed.

While average figures show that city families, in the spring of 1948, used 2.4 pounds of meat per person in a week, 20 percent of these families used less than 1½ pounds per person in any one week, and almost 10 percent used 4½ pounds or more per person.

It was found that when city families used relatively large amounts of meat they also used more potatoes, but smaller amounts of poultry, fish, milk, and certain vegetables and fruits than did families that ate less meat. The meals containing the large amounts of meat were higher in protein, iron, thiamine, and niacin than those containing little. The latter, however, provided more calcium and vitamins A and C. The findings emphasize the advantage of variety and balance in diets for best nutritional results.

Strong and weak points in diet

Most city families—about 9 in 10—got recommended amounts of protein, iron, and vitamin A in their diets in 1948—a period when national supplies of nutrients were fairly ample and comparable with 1951. The nutrient most frequently found short was calcium, which was below recommended levels in 30 to 40 percent of family diets.

The unevenness with which some nutrients reach individual families—even when abundant in the national food supply—is illustrated by some of the vitamins. Although in per capita terms our national food supply in 1948 provided vitamin C and three B vitamins—thiamine, riboflavin, and niacin—exceeding recommended allowances by about one-third, 20 percent of city families got less than recommended amounts.

The role that low purchasing power plays in dietary weaknesses can be readily seen when families and their diets are grouped by income. The low-income groups have the smallest proportion of families getting enough of each of the important nutrients—protein, calcium, vitamin A, vitamin C, riboflavin, and thiamine. At every income level, however, there is a sizable proportion that fails to get calcium in recommended amounts.

ADVANCES IN NUTRITION KNOWLEDGE

The Body's Response to Diet

Vitamin C in adolescence

Bodily requirements at certain stages of human development are yet to be determined more precisely by physiological and biochemical research, even though the amounts needed of many important nutrients are known within broad limits. A contribution to such knowledge has been made through a study of the vitamin C metabolism of boys and girls in their late teens, cooperative with the Oregon Agri-

cultural Experiment Station. It was found that although amounts of this vitamin recommended by the National Research Council did not supply the blood plasma of either boys or girls with vitamin C to saturation point, the amounts proved ample to maintain the blood at levels generally considered adequate.

Vitamin E deficiency

In the course of research with rats fed diets short in vitamin E, some of the young were found to develop eye abnormalities of a kind not previously observed in these laboratory animals. Inasmuch as small, prematurely born human infants sometimes develop a serious eye impairment which has recently been linked by ophthalmologists with a shortage of vitamin E, the Bureau's experience in producing a somewhat similar condition in the rat may prove useful to those seeking to investigate further the nature, cause, and prevention in premature infants of the disorder known as retrobulbar fibroplasia.

Response to various food combinations

With nutrition still a young science, a great deal remains to be learned about the body's need for combinations of nutrients as well as for individual nutrients. By feeding selected experimental diets to laboratory rats not only over their entire life span but even through successive generations, the Bureau has observed that combinations of food that seem to provide adequately for growth may tend to accentuate certain chronic ailments commonly associated with age. Although the rat's response to diet may not be identical with that of man, much can be learned about the influence of entire diet patterns on growth, reproduction, and aging. These research fields should be explored fully.

Further Knowledge of Food Values

Vitamin A value of plant foods

Each year brings progress in the long task of making food composition tables more complete and exact and, therefore, more valuable as guides.

Continuing investigations to determine how much of the carotenes in various plant foods are actually converted into vitamin A to serve bodily needs, the Bureau, using the young rat as the tool in measurement, has found that in pumpkin, as in the carrot and sweetpotato, the proportion is only 25 to 35 percent. However, these yellow vegetables contain such a rich store of carotene that they are good sources for vitamin A, despite the small proportion utilized. The reverse state of a food containing little carotene, most of it utilized, has been found in meal made from whole yellow corn. Seventy-five to eighty percent of carotenes in this corn meal are used for vitamin A by laboratory animals—a proportion comparing favorably with such green leafy foods as cooked kale (67 percent). Further work is needed on the important subject of the utilization by the body of nutrients in food.

Folic acid tables

Systematic knowledge of the amount of folic acid present in familiar foods was forwarded during the year by completion of the report on

the analysis of a large number of foods, together with a compilation of findings from other laboratories. The Bureau's assays for this B vitamin, important for healthy growth and blood formation, dealt with more than 160 foods and were supplemented by cooperative work at the Texas Agricultural Experiment Station, where a number of foods grown in the South and Southwest were analyzed.

In the technical report (Agricultural Handbook 9, in press) tables showing the folic acid content of foods are presented, together with the microbiological procedure which the Bureau found satisfactory, in experiments made for the purpose of improving and standardizing this type of method for determining content of this nutrient in foods. The report is a step toward estimating the amounts of this B vitamin in everyday diets.

Vitamin C in foods prepared in quantity

The amount of ascorbic acid (vitamin C) in foods prepared for service in two college dining halls was determined in connection with a study of ascorbic acid requirements of older adolescents, made cooperatively with the Oregon Agricultural Experiment Station (see p. 3). Every food known or thought to contain vitamin C was analyzed for reduced ascorbic acid each time it was served during a period of about a month. In quantity food service, where food may be held for a considerable period, the loss of this vitamin may be accentuated to a greater extent than in home kitchens. These data supplement the meager figures on institution-prepared food, and are a useful byproduct of work done for a related primary objective.

Food facts for consumer educators

Bringing together reliable information from many sources, the Bureau has undertaken to issue a series of semitechnical bulletins on individual articles of food. The first two, dealing with tomatoes and peaches, provide facts on nutritive value, food value for money spent in comparison with other foods, seasonality of supplies, selection and use of different varieties, grades, and forms, and use in family meals. This assembling of dependable information is designed to meet the needs of Extension workers, marketing specialists, writers, and others engaged in consumer education, who heretofore have found the task of assembling it a time-consuming one.

INSTITUTIONAL USES OF FOOD

Good Management—Good School Lunches

Among the aims of a school lunch program are that meals meet nutritional goals, that a large proportion of pupils participate, that the children find the food enjoyable and satisfying, and that the price be within pupils' means. To help supervisors evaluate their management practices in these respects, the Bureau has provided a suggested schedule and a checklist of points for comparing local results with those in 39 schools in different parts of the country in which management practices have been appraised. These aids to supervisors are included in a publication which gives also an analysis of case stud-

ies of the 39 schools surveyed as a basis for evaluating management practices.

The bulletin in which this information is given, School Lunch Management in Relation to Nutritive Value, Cost, and Acceptance of Foods Served, is already in demand by college instructors of institutional management classes. It has had extensive use in workshops for training school lunch personnel, and State and county school lunch supervisors have expressed interest in using it to improve lunch programs under their direction.

Effect of School Lunch on Nutrition

Recommended research procedures for appraising nutritional aspects of a school lunch program were issued this year. These were developed in a pilot study outlined several years ago by an Interdepartmental Committee on School Lunches, and carried out by the Bureau in cooperation with the United States Public Health Service and State and local authorities.

The study compared children in two elementary schools. One of these had a school lunch program; the other, because of lack of facilities, did not have such a program. The Bureau had responsibility for study of the children's patterns of eating at school and at home; for the biochemical analyses for serum ascorbic acid; and for the chemical analyses of school lunch meals as served.

It was found that children getting school lunches had better diets than those without, especially with respect to calcium, ascorbic acid, and vitamin A value. Analysis of school lunch meals showed that, in general, when milk was included, the children received in the meal one-third of the daily allowances for protein, calcium, and riboflavin recommended by the National Research Council. Frequently less than one-third of these allowances for ascorbic acid and thiamine was provided in meals; even so, the ascorbic acid values of the blood serum were higher for children with the school lunch than for those without. Seasonal variation in the ascorbic acid in the blood was noted, as well as differences attributable to participation or nonparticipation of children in the school lunch program.

Suggestions in the report for carrying out further research of this kind include details regarding the sampling, the experimental design of the study, physical examinations, biochemical tests, and dietary records.

HOME FREEZING AND CANNING OF FOOD

Advances in Technology

Over the past few years, the public's eagerness to freeze a wide variety of foods at home has outpaced the ability of research to provide all of the detailed information wanted on home freezing methods. To resolve some of the more pressing unanswered questions considered in a conference of home freezing specialists held in 1949, the Bureau has conducted a number of short-term laboratory experiments on yields of frozen food from fresh food, sweetening agents and anti-oxidants for certain foods and food products, head-space requirements for packing foods for freezing, preheating and cooking methods for

frozen vegetables, and on the quality of the frozen product in relation to the variables studied. Results of this work and recent research in other laboratories are brought together in a new popular bulletin on the home freezing of fruits and vegetables, now in press.

A revised edition of the Bureau's popular bulletin, Home Canning of Meat, has been issued. Included for the first time are directions wanted by many homemakers for canning at home such mixtures as pork and beans, and meat and vegetable stew. The processes recommended for pork and beans are based on research by the Massachusetts Agricultural Experiment Station in cooperation with the Bureau. A time-saving method of packing chicken raw for home canning, based on Bureau experiments, is also included.

Extent of Home Canning

While it is well known that practically all farm families preserve some of their own food supply each year, the extent of similar practices in city households since World War II has been a point for questions by educators as well as by businessmen planning production and advertising, and by Government agencies responsible for distribution of food or allocation of materials used in canning.

The Bureau's survey of city families' food consumption in 1948 offered a chance to obtain this information. A report issued during the year has proved of timely value in connection with the national program to step up home gardening and food preservation, and to provide enough materials for these activities in rural and urban markets.

The figures show that in cities of 2,500 or more persons, almost half of the households do some home canning of fruit and vegetables, and the average quantity canned by these families is 85 quarts. Home canning activity is in reverse proportion to city size: In the smallest cities more than 60 percent of the families can some food; in the largest cities only 20 percent. The average quantity canned by the small-city families that did any canning at all was 107 quarts, considerably more than the 65 quarts canned by the families in metropolitan areas.

Wide differences are found also in the amounts canned by farm families. In a survey of food consumption in cotton, tobacco, and mountain farming areas of the South, home-canned vegetables and fruits averaged 97 quarts in 1947 in the cotton area, 169 in the tobacco, and 349 in the mountain area. The survey was conducted as a Southern Regional Project, the Bureau cooperating.

CLOTHING AND TEXTILE RESEARCH

Clothes Families Wear

Although the people of this country spend about 24 billion dollars a year on clothes, little is known about the kinds and amounts that families have in their wardrobes at any one time, and about choices made in purchases. The Bureau is now analyzing figures from its survey of clothing owned by about 500 families in the Minneapolis-St. Paul area, and for comparison, 68 families in Birmingham, Ala., and about 300 farm families in two rural counties near the Twin Cities. While limited in scope geographically, the information so

far collected may be an indication of practices of larger groups of the population.

Reports thus far issued provide information on the customary stocks of clothing in city wardrobes; how ownership differs at three income levels; how ownership differs among family members, from young to old; differences in purchases between families in the northern and southern cities; and information on clothing acquired from other sources than purchase of ready-made clothing, such as by gift, home sewing, and handing down of garments.

Although home sewing was more prevalent among farm than city families, it was an important source of new garments for only a few types of clothing worn by farm women and girls. Dresses, sun suits, play suits, and aprons were the items most frequently made at home for the girls; and aprons, smocks, and house dresses for the women. Even in farm families, home sewing for the wardrobes of men and boys was unimportant.

The clothing reports, which indicate where markets are for some of the Nation's principal fiber products, are in demand by marketing groups concerned with consumer stocks of textiles and apparel. The reports are of use also to defense agencies concerned with civilian supplies and requirements. The information is also used by teachers in planning courses for college, high school, and homemaker groups, and by welfare workers in plans for family assistance.

House Furnishings

Homemakers in increasing numbers are seeking help in planning effective house furnishings. To assist them in selecting window curtains of high quality and decorative value, the Bureau issued a bulletin, illustrated in color, which outlines the principles of planning and selecting fabric curtains. Included in this publication are pointers on the use of color, texture, line, and design in curtains to create harmonious rooms, suggestions for curtaining different kinds of windows, and information about suitable fabrics. Loan exhibits and a slidefilm supplementing the bulletin are being developed for the use of Extension leaders and teachers.

Fabric Deterioration

Wool and other fabrics made from protein fibers are subject to attack by molds and other micro-organisms. The Bureau has under way research to determine the nature of the deterioration and methods of preventing this loss of valuable fabric.

For use in this work, a micro-organism belonging to the genus *Streptomyces* was isolated from wool uniforms which had deteriorated in storage in the tropics during World War II. A cell-free enzyme preparation, obtained by culturing the organism, has been found an effective tool in comparing the susceptibility of such fabrics to microbial attack. Fibers made from the protein of milk, corn, and peanuts were found to be more susceptible to the enzyme than wool, or fiber from soybeans. Experiments have shown, for example, that a casein fiber sometimes used as mattress filling is very susceptible to microbial damage, and that such filler material may not be suitable for use in warm, humid climates.

Because of new features of the findings, requests have come from other laboratories for cultures to be used in enzyme studies. Phases of the work were presented at the International Congress of Microbiology in Rio de Janeiro in August 1950.

Disinfectants in Household Laundry

Another phase of microbiological research with textiles is that concerned with the sanitation of clothing. Increased use of new household laundering disinfectants, especially for infants' clothing and bedding, prompted study of five compounds sold under various trade names for this purpose. Results showed that directions recommended by the manufacturers generally did not provide strong enough treatment to disinfect the fabrics. Further work is in progress to find the dilutions effective for this purpose in commercial laundries and for household use.

FARMHOUSE IMPROVEMENT

Census figures of 1950 point up the extent to which farmhouses lag behind city dwellings in comfort and convenience. Twenty-one percent of farmhouses were in such poor condition that they were classified as dilapidated, in contrast to only 6 percent of urban houses so classified. However, many farm families in the last few years have built new homes or have made major improvements in their present homes, and many others want to do so.

Farmhouse Plans for Low-Income Families

As a result of their experiences in carrying out the Housing Act of 1949 and in earlier work with families, local and State officers of the Extension Service and the Farmers Home Administration have stressed the importance of simplified working drawings for farmhouse plans that can be used by families doing their own construction.

New and revised plans for a number of low-cost houses, including several expandible houses, with working drawings geared to the needs of country carpenters and farmers who want to do their own building, have been prepared cooperatively with the Bureau of Plant Industry, Soils, and Agricultural Engineering. A total of 17 new or revised plans were prepared at the Agricultural Research Center. Of these, eight were plans requested by the Farmers Home Administration and five were new plans for expandible houses.

Six states have cooperated in the preparation of plans adapted to regional needs. They have submitted for approval a total of 25 additional plans. Of these, working drawings for 13 have been completed and plans for 6 have been published in two leaflets. The plans are made available through the State Extension Services.

Kitchen Plans

Kitchen plans are frequently sought by farm families desiring to remodel their homes for greater convenience, or to build new homes. Now in press is a new Bureau publication, *Your Farmhouse—Planning the Kitchen and Workroom*, which summarizes basic principles

of work simplification and illustrates efficient layouts of space and equipment. Plans for kitchens and workrooms of various sizes, with different arrangements of installed equipment and showing necessary clearances for safety and convenience, are included. The bulletin also gives designs for functional storage facilities, and present-day information on installed equipment, table-top and floor materials, and wall finishes.

Home Lighting

Recommendations for lighting the house, yard, and farm buildings properly to protect eyesight, make work easier and safer, and contribute to the productivity of the farm, are contained in the bulletin, Electric Light for the Farmstead, prepared during the past year in cooperation with the Bureau of Plant Industry, Soils, and Agricultural Engineering. Common types of fixtures and lamps are illustrated and described in this publication, and the best uses and limitations of each are presented. A brief section outlines some of the possibilities in the use of special lamps such as heat, sun, bactericidal, and insect-trap. Suggestions also are made for care and upkeep of lighting equipment.

HOME EQUIPMENT

Farm Refrigeration Systems

Many farmers have expressed the need for enlarged refrigeration systems on their premises to use in preparing meat, poultry, and other perishable products for the market and in preserving these home-grown foods for family use. The Bureau, in cooperation with the Bureau of Plant Industry, Soils, and Agricultural Engineering, made a survey of 160 home-built two-temperature walk-in farm refrigeration systems, as a basis for developing improved designs. Adequacy of the facilities, type and cost of installation, problems in construction, cost of operation, operating problems, and families' habits of use were among the aspects studied.

The survey showed: (1) Farmers both want and need enlarged on-farm refrigeration facilities; (2) in general, the systems studied were not designed to meet the needs of farm families; (3) no established design was followed either in the construction of the refrigerators or in the refrigeration systems; (4) the facilities were not being used to best advantage or to full capacity; (5) when the best use was being made of the refrigerators, they were helping to provide a good food supply for the family and were adding to the farm income.

These facts have been brought to the attention of manufacturers of farm refrigerators of this type, and of Extension engineers working with farmers on refrigeration problems. In addition, based on these findings, designs for two-temperature walk-in refrigerators have been developed and experimental units have been constructed. These are now being tried out under laboratory conditions and on farms.

Home Freezers

Although frosting on the walls or shelves of home freezers does not significantly affect operating efficiency, defrosting periodically has been found to be advisable from the standpoint of maximum use and convenience. Bureau studies to determine the effect of frost deposit on the efficiency of a chest-type home freezer operating at 0° F. showed that accumulation to a depth of one and one-half inches on the evaporator liners does not cause a harmful rise in temperature of the freezer nor does it affect the cost of operation significantly. It reduces the capacity of the freezer, however, and makes for inconvenience in use.

Performance of Washing Machines and Water Heaters

Experimental work on home laundry equipment is under way to determine more exactly what performance can be expected from different types of washing machines and to develop more desirable procedures for their use. Because the comparative effect of different methods of water extraction on the wear of fabrics has been frequently questioned, three woven and two knitted rayon and nylon fabrics were examined for shrinkage and breaking or bursting strength after water extraction by three methods: With a wringer, with a spinner, and by pressing the fabric between absorbent towels. After 50 washings, no significant differences were found in the measured effects of wear among the three methods of water extraction.

The relative advantages of loading a washing machine to capacity to save time and to make a thrifty use of water and detergent, were compared with the advantages of using a smaller load. Nineteen machines—automatic and nonautomatic—were used in this experiment. The comparison indicated that clothes were cleaner when washer loads were decreased. Soil was more adequately removed and more even washing resulted with 6- or 7-pound loads, or less, than with heavier loads up to the rated capacity of the machines.

Studies were made of the performance of water heaters of the automatic storage type, in conjunction with automatic washers which varied in their hot water requirements. From the heaters tested, maximum quantities of water delivered at one time (at temperatures within 10 percent of the thermostat settings) varied from 50 to 90 percent of their rated capacities. Of five heaters (30- to 80-gallon capacity) tested with four automatic washers, none would deliver hot water for more than two successive loads of clothes for the washer requiring the most hot water per cycle.

Basic information obtained in this research will be incorporated in bulletins on how to choose and use home equipment.

RESEARCH SERVING EMERGENCY NEEDS

Since food and fiber are vital commodities in national defense, the continuing research of the Bureau, most of which is concerned with the effective and economical use of these products by the ultimate con-

sumer, is a contribution to defense. In addition, considerable effort is being directed toward short-time studies to meet special requests. The military services have presented some of these requests for research which could best be handled through use of the Bureau's resources. Other requests for facts and figures on diverse topics affecting the home have come from agencies responsible for policy or programs affecting civilian welfare. Two examples of this work in the past year follow:

Food Composition Facts for the Military Services

As a national source for up-to-date information on food composition, the Bureau was requested by the Quartermaster General to prepare a publication on this subject, adapted to the needs of the armed forces. This has been completed. The bulletin gives information on composition of 800 food items, including 160 special ration items that are manufactured or prepared according to specifications of the armed forces. The foods are arranged in the 16 groups regularly used for planning military meals, and for each food item is given the most exact information now available in terms of calories, protein, fat, carbohydrate, calcium, iron, and five vitamins. This work was financed in part by the Department of the Army.

Handbook on Group Feeding

At the request of the National Security Resources Board, the Bureau prepared a manuscript on group feeding in emergency situations, to be published by the Federal Civil Defense Administration. This was planned for use of State and local Civil Defense workers who might be called upon to feed groups of uninjured persons during a short-time disruption of utilities or evacuation of people. The suggestions given for food supplies, menus, recipes, food-service management, and related information needed for feeding groups were adapted from the Bureau's research on food management and quantity food service.

CONTRACT AND COOPERATIVE RESEARCH

Many phases of Bureau research are expedited through contract and cooperative arrangements with institutions which have specialized personnel and facilities. Eight contracts initiated in 1951 brought to a total of 30 the number of Bureau-sponsored contracts in progress during the year in State and nongovernmental laboratories. These studies deal with food composition; human requirements for thiamine, riboflavin, and amino acids; and the physiological utilization of ascorbic acid from various food sources.

In addition to contracts, cooperative studies dealing with the serviceability of textiles, rural family living, food preparation, and children's food-energy requirements entailed Bureau expenditures in various States and extended its program during 1951 to 39 institutions in 25 States and Hawaii. To facilitate cooperative researches, 87 staff members were stationed in 18 States.

Along with State agricultural experiment stations, the Bureau participates in the activities of technical committees in each of the four regions of the country that are concerned with solving regional problems of housing and nutrition. The Bureau forwards research relating to these problems through cooperative and contract arrangements and by investigating segments of some problems in its own laboratories.

PROGRAM PLANNING AND WORK MANAGEMENT

The organization and program of Bureau research are periodically reviewed by its administrative and supervisory staff to insure that priority is given to the research regarded as most essential to fill the gaps in knowledge in the field of human nutrition and home economics. In appraising the program this year, the Bureau had the benefit of suggestions from an advisory committee of the American Home Economics Association and from the Agricultural Research Policy Committee. Many recommendations for new or expanded research also have come from committees sponsored by the Association of Land-Grant Colleges and Universities and departmental advisory committees composed of representatives of science, industry, producers, and the public. About 80 percent of the Bureau's present work lies within the interests of these advisory committees.

With employment smaller by 58 man-years in 1951 than in 1950, conservation of manpower through increased efficiency of operation has received renewed emphasis in the Bureau. Sixteen suggestions by employees for improvements in work management have been adopted, and cash awards have been made to seven employees for suggestions that have reduced the cost of certain Bureau operations, thus enabling greater output for the same expenditure. In recognition of outstanding achievement, the Distinguished Service Award, the Department's highest honor, was received in 1951 by one woman scientist and two groups of employees, and Superior Service Awards by four individuals in the Bureau.

SUMMARY OF RESEARCH PUBLICATION

The fund of basic knowledge in the field of nutrition and home economics is being augmented by the 64 new popular and technical bulletins published or submitted for publication during the year, and 45 technical articles printed in 25 different scientific or professional journals.

In addition, 58 press releases brought up-to-date information from Bureau research to the attention of about 6,000 food editors of newspapers, women's page editors, directors of women's radio and television programs, home economists in industry, and Extension workers. The Bureau also prepared and broadcast 10 radio and television scripts, mostly on Nation-wide hookups, and cooperated with the Department's Radio and Television Service in the preparation of a series of movie shorts for television use.

Three film strips, putting Bureau research results into visual form, were completed and copies placed in film libraries in virtually all of the States for loan to Extension workers, teachers, and other leaders. Also two series of slides were prepared for use in training courses for school lunch workers.

Indicative of the interest of the public in the Bureau's research is the distribution during the year of almost 5½ million copies of the more than 150 popular and technical publications currently available. Five Bureau motion-picture films currently in circulation, had 15,146 showings, reaching an estimated audience of almost a million persons. A total of 2,494 persons from all over the Nation and from many foreign countries visited the Bureau's laboratories during the year.

U. S. GOVERNMENT PRINTING OFFICE: 1951